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Measuring and Forecasting General Business Conditions

By
Warren M. Persons

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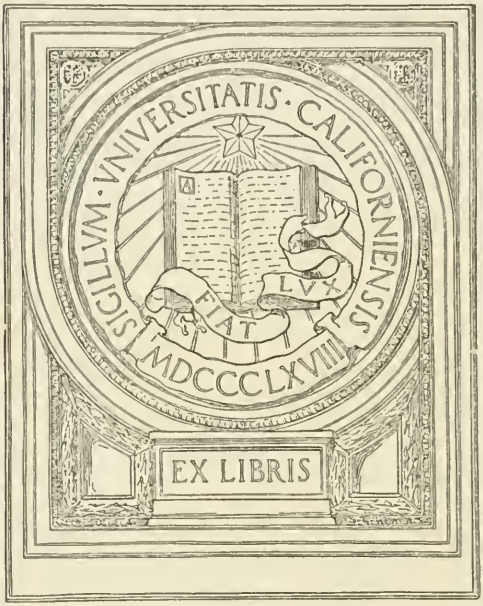


GIFT OF
Dr. and Mrs. A.B. Pierce

Measuring and Forecasting General Business Conditions

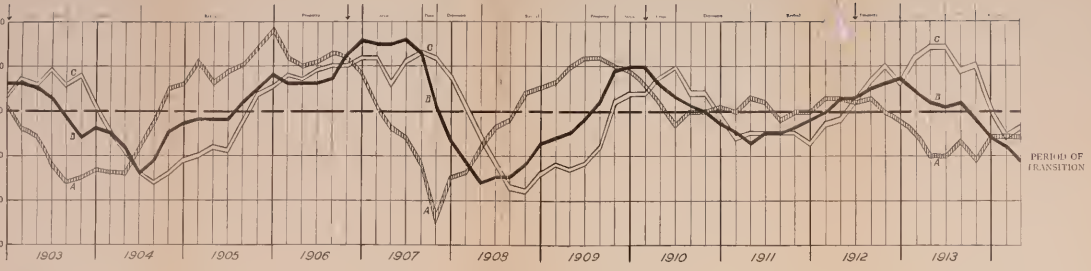
By
WARREN M. PERSONS, Ph.D.

Professor of Economics, Harvard University. Editor of *The Review of Economic Statistics* and *Statistical Service*, published by the Harvard University Committee on Economic Research.

AMERICAN INSTITUTE OF FINANCE

INDICES OF SPECULATION, BUSINESS, AND BANKING: 1903–14 AND 1918–20

BI-MONTHLY AVERAGE OF CYCLES



Explanation [illegible] those of business by 4 to 10 months, and the movements of business preceded those of banking by 2 to 8 months. The sequence of movements holding for upward swings and crests also held for downward swings and troughs. The relationship between the curves which held for the pre-war period appears to have re-established itself in 1919 so that the movements of the curves constitute a basis for forecasting. Our forecasts, however, are not based solely upon the index of general business conditions, but they allow for the deflecting influences underlying conditions as revealed by economic analysis.

In early 1920 the persistent rise of rates on commercial paper, curve C, and the decline of speculation, curve A, forecasted the decline of business activity and commodity prices curve B, which took place between April and December 1920.

LENGTHS AND FEATURES OF VARIOUS PHASES OF BUSINESS CYCLES DURING 1903–14

PHASE	Nov. Dec. 1903 to Nov. Dec. 1904 Months	Jan.-Feb. 1905 to Jan.-Feb. 1906 Months	Mar.-Apr. 1907 to Jan.-Feb. 1908 Months
PHASE I (DEPRESSION)	10	8	10
Low prices of securities and volume of speculation			
(b) Declining commodity prices and business activity			
(c) Declining rates on commercial paper and increasing bank reserves			
PHASE II (REVIVAL)	18	11	12
(b) Revival of speculation in the securities markets			
(c) Recovery of business activity and increase of commodity prices			
Increase of rates on commercial paper and decrease of bank reserves			
PHASE III (BUSINESS PROSPERITY)	10	5	6
(a) Speculative activity at its height			
(b) Business activity and commodity prices continue to increase			
(c) Rates on commercial paper continue to increase and bank reserves to decrease			
PHASE IV (FINANCIAL STRAIN & DEFLATION OF SECURITIES)	10	4	8
(a) Long bear market in securities and decrease in the volume of speculation			
(b) The upward tendency of business activity and commodity prices reaches its peak			
(c) Rates on commercial paper rise to their highest point and the banking situation is strained			
PHASE V (INDUSTRIAL CRISIS & DEFLATION OF COMMODITIES)	4	4	4
(a) [illegible] speculation is dormant and speculative markets are panicky			
(b) Commodities are liquidated, prices fall, and business activity changes both			
(c) Rates on commercial paper reach minimum and [illegible]			
[illegible]	52	32	40

[illegible] phases II, III, and IV [illegible] the period lasting up to the time [illegible] the preceding periods of business revival, each group of the [illegible] 22 months and 24 months respectively. In each of these [illegible] the business was revived and not allowed to be a panic

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MAKING MONEY MAKE MORE MONEY

This list is arranged in the order of proper reading. The books are accompanied by a series of test questions, key problems and analyses outlines, enabling the student to apply the knowledge acquired to immediate stock market and investment conditions.

1. *Developing Financial Skill*
2. *Forces Which Make Prices*
3. *Manipulation and Market Leadership*
4. *Handling a Brokerage Account*
5. *Market Information*
6. *The Essential Features of Securities*
7. *The Value of a Railroad Security*
8. *Industrial Securities*
9. *Oil Securities*
10. *Mining Securities*
11. *Investment Securities*
12. *Business Cycles*
13. *Measuring and Forecasting General Business Conditions*
14. *The Technical Position of the Market*
15. *Money and Credit*
16. *Business Profits*
17. *Launching a New Enterprise*
18. *Securing Capital for Established Enterprise*
19. *Internal Financial Management*
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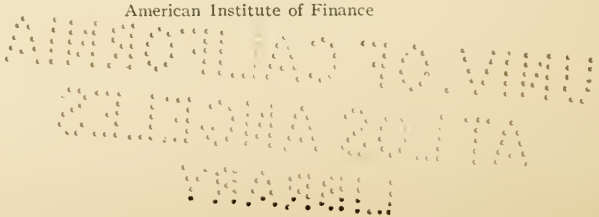

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Test Questions

CHAPTER I

THE PROBLEM: WHEN TO BUY OR SELL

Prices and Price Movements

In modern industrial life the various forms of activity — farming, mining, manufacturing, jobbing, transporting, retailing, banking — are inter-related and inter-dependent. Each industrial unit depends upon other units for raw materials and services as well as for a market. Each unit, therefore, is both purchaser and seller of goods for present or future delivery. The connection between the various units is maintained through contracts having *price*, whether of commodities of labor or of securities, whether prices, wages, or interest, as the main characteristic. Price movements considered in the broadest sense are the outstanding features of business cycles of prosperity and depression.

Every individual, corporation, or firm in business is, necessarily, interested in prices. Profits are secured in normal times through careful buying and intelligent selling. The problems of the manufacturer, the dealer, the speculator, or the investor are, first, the selection of the kind of security or commodity to buy or sell, and second, the selection of the time for purchase or sale. In the present discussion we are interested in the second problem — *the selection of the time* for purchase or sale and the increase or decrease of commitments.

The Problem Stated

The nature of a business enterprise determines in general the nature of the commodities or securities in which the given concern must deal. The question, *when to buy or sell*, therefore, is really much more important to a given concern than the question *what to buy or sell*. The problem when to buy or sell is one the solution of which depends upon the fluctuations of the business

cycle. Everyone knows that there *are* periods of prosperity and periods of depression, that there are ups and downs of business. The knowledge of this fact, however, is not a solution of the problem before us; that solution will not be obtained until we put our answer in quantitative terms. The definite problem before us, therefore, is to secure answers to the questions *how much* and *how long* in regard to various forms of business activity, present and prospective.

CHAPTER II

THE METHOD: CONSTRUCTION OF AN INDEX FOR MEASURING AND FORECASTING GENERAL BUSINESS CONDITIONS

Two Methods of Procedure

In attempting to measure and forecast at the present time, speculation, business activity, commodity prices, and interest rates, there are two obvious methods of procedure. First, we may draw parallels between the present post-war period and similar periods such as those following the Civil War and the Napoleonic Era. Careful examination of these periods, however, will lead one to the conclusion that the dissimilarities are more marked than the similarities to the present. There are valuable lessons to be learned, to be sure, from a study of these periods but great caution must be exercised in using these periods as precedents.* One of the great, perhaps insuperable, difficulties we encounter is the scanty data obtainable for the earlier periods. Quantitative results are difficult or impossible to obtain.

A second method is to make an intensive analysis of the immediate past and interpret the present in the light of the results thus secured. This method has certain evident advantages: There is a much larger volume of statistical data available: the economic organization is similar to that at the present; it is easier to see what changes have taken place and to allow for them.

Discrimination Required

The lessons even of the immediate past, however, are not obvious; they must be deciphered. Careful scientific study of the data, of relations and correlations, is required. The data

*See the *Review of Economic Statistics*, October, 1919, and following numbers, for discussions of these periods.

necessary to measure business and speculative activity consist of statistical series of various kinds, such as commodity price indices, pig-iron production, bank clearings, and interest rates. It is as important to find out the differences in the regularity, sequence, and violence of the fluctuations of these series as it is to ascertain the similarities.

The usual method of securing a numerical measure of business activity is to average a miscellaneous group of statistical series and thus secure a composite. This procedure disregards significant differences and, as will be shown in the sequel, results in blurring the picture rather than making it more distinct.*

Analysis Which Has Been Made

In attempting to answer the question, *is the present the time to buy or sell?* the pre-war period 1903–14 was analyzed. In order to get quantitative results the analysis was based upon statistical series. In order to get clean-cut conclusions attention was paid to the dissimilarities as well as to the similarities among the series. The entire analysis had as its object the securing of an index of general business conditions. The index secured is fully described and its current meaning is set forth here and in publications of the Harvard University Committee on Economic Research.

Statistical Items Composed of Four Elements

Our index of general business conditions is derived from those series of monthly items of the industrial, commercial, and financial statistics which ordinarily serve as the basis for judgments concerning the fundamental speculative, business, and banking situation. Measurement of business activity, however, is relative to some standard. Isolated items of statistical series, upon which such a measure must be based, can have no

*The practice of averaging a number of statistical series is bad statistical practice unless there is a peculiar reason for averaging them. One secures nothing but confusion by averaging unlike items. Moreover, it may be stated at the outset that the adoption of an empirical rule of interpretation such as "action and reaction are equal" is apt to lead one astray.

significance by themselves. Only by a comparison of items over a period of time can we ascertain their meaning.

Items pertaining to widely separated times cannot, moreover, be used in their crude form. Each monthly item of bank clearings, pig-iron production, interest rates, and the like, is a composite, the make-up of which depends on the year and season. That is, various elements contribute to make bank clearings for January, 1920, for instance, the precise total reported. In general the actual items result from the combination of four elements — secular trend, seasonal variation, cyclical fluctuation, and a residual factor.

Secular Trend

The secular trend is the regular increase or decrease, according to some principle, over the whole period under consideration. For most series it is a growth element, dependent upon population and the development of industry. There is a normal change year after year in a developing or altering industrial society, just as there is a normal change in the physical or mental status of a growing child. As used in this exposition, the expression "secular trend" may refer either to a statistical series or to one item of a series. When it refers to a series it means the straight line fitted to the data; the measure of growth is given by the slope of the straight line. When the expression refers to one item of a series it designates the vertical distance (or its numerical value) from the curve or line of trend to the zero or base line.

Seasonal Variation

The seasonal variation is the movement of the items within the year, which we attribute to the round of the seasons. There is a seasonal change in various lines of business activity just as there is a seasonal change in temperature or rainfall. Although an iron-clad system is not to be expected, the movement of the items, to be seasonal, must be systematic year after year. The seasonal variation of an item for any month is given by an index

which expresses the "normal" for that month as a percentage of the preceding month or of the monthly average for the year.

Cycles

The cycles are the undulating curves (or the numerical values) secured by removing from the actual items the secular trend and the seasonal variation, and expressing the results in terms of comparable units.* The actual figures thus corrected and expressed measure the rhythmic movement of business, the ebb and flow corresponding to depression and prosperity.

Residual Element

The residual element includes all sporadic developments which affect individual series, or to widespread changes due to momentous occurrences, such as wars or national catastrophies, which affect a number of series simultaneously. Thus pig-iron production may take a sudden slump if a strike occurs, railway gross earnings may drop because of unusual storms or floods, trading on the stock exchange may be greatly affected by a court decision.

This irregular or residual element has not been eliminated by our process of correcting the data, and hence it is present, along with the cyclical fluctuation, in the statistics used in constructing our index.

Essential Refinements

In order, then, to adapt the statistical data to our purpose, the securing of a numerical measure of the ebb and flow of business, two problems were solved:

First, we devised a method of correcting the statistics for secular trend and seasonal fluctuations; that is, we unravelled the tangle of elements which constitute the fluctuations in funda-

*The units used are the standard deviations of the respective series. The standard deviation is an average which is so constructed that it varies directly with the dispersion of the items. See page 15 following. The cycles are the "percentage deviations of actual items from secular trend corrected for seasonal variation" divided by the "standard deviation."

mental series. In other words, we devised a method whereby the actual series of business statistics now published in our trade and financial journals were set forth in such a form as to be significant and reliable indices of business conditions.

Second, having corrected the various series of fundamental statistics for secular trend and seasonal variation, it was necessary to solve another statistical problem. The corrected series have wave movements; for all corrected series the elapsed periods from crest to crest or trough to trough are approximately the same. The *times*, however, at which crests or troughs of the waves of the several series occur are frequently not the same. Nevertheless, there are *groups* of series in which the wave movements are simultaneous. In order to get the information which the statistical series have to give, it was necessary to sort them according to the times at which points of maxima or points of minima are reached; that is, it was necessary to sort the series in order of the sequence of their fluctuations.

The solution of the problems just stated gave us an index which measures the general business conditions of the past.

Supplementary Economic Analysis

In order to use the conclusions thus obtained, however, as a basis for forecasting the future, there is another requirement. The past is not exactly like the present and future; it is only more or less similar. A statistical measure based upon the past may be used in the present and future only insofar as the underlying economic conditions of the past are similar to those of the present and future. An index of general business conditions can be safely used in forecasting general business conditions only when the present is shown to be similar to the past in all essential elements or when allowance is made for such differences as occur. Therefore, for forecasting on the basis of any indices of general business conditions obtained from the data of the past, a supplementary economic analysis is necessary.

At the present time, for instance, any forecast, to inspire confidence or even to command respect, must allow for the

changes in our banking system since 1915, the recent change of the United States from being a debtor to being a creditor nation, and the destruction and shortage of materials caused by the war.

Summary

Our method of forecasting, therefore, is based upon *statistical analysis* supplemented by *economic analysis*.

The statistical analysis requires, first, the correction of the actual statistics so that the corrected figures will show the ebb and flow of business prosperity and depression, and second, the determination of the order of occurrence of the cyclical movements of the corrected series.

The economic analysis requires a careful examination of the underlying economic structure of the present and past. Any forecast made on the basis of the index of general business conditions, which is the result of the statistical analysis, must allow for the differences in underlying conditions as revealed by the economic analysis.

CHAPTER III

EXPLANATION OF CORRECTED STATISTICS

Eliminating the Secular Trend

The object of correcting the actual data is to secure comparable items over a period of time, that show the fluctuations of the business cycle. The need of eliminating secular trend and seasonal variation from statistical series before attempting to employ them as indices of business conditions, as well as the method which we have used in such elimination, may be made clear by a simple illustration.

Our purpose is to judge the significance of items for different dates. Let us take the production of pig iron in the United States at any three dates some distance apart from each other. The tonnage of pig iron produced in the United States in March, 1904, was 1,447,000, the tonnage in February, 1908, was 1,077,000, while the tonnage in December, 1918, was 3,434,000. Which one of these figures indicates the greatest relative activity of the iron industry, relative, that is, with respect to the facilities of the industry at the time in question?

To answer this question we must take account of the fact that the country and the iron industry have grown in the interval from March, 1904, to December, 1918. It is obvious that if the growth were by equal monthly increments, a "normal" of 1,528,000 tons in March, 1904, for instance, would not be normal in 1908 or 1918. On the assumption of uniform growth the normal of February, 1908, would be 1,901,000 tons, and that of December, 1918, would be 2,932,000 tons. The actual production figures for the three months are 1,447,000 tons, 1,077,000 tons, and 3,434,000 tons, respectively. The ratios of the actual figures to the corresponding "normal" figures are 95 per cent, 57 per cent, and 117 per cent, respectively. From

these figures we conclude that the pig-iron industry was most active at the last-named date.

Omitting the percentage signs, the figures just given are termed indices. They are indices of pig-iron production so constructed, by the use of bases increasing with time, that the normal growth, or "secular trend," is eliminated.

Eliminating Seasonal Variations

But there is another type of fluctuation which must be removed before the figures may be used as indices of business conditions. We must remove from the data those variations which are purely seasonal in character, which recur year after year as a consequence of the round of the seasons. If we could assume that the conditions of all the months of the year are alike, that there is no characteristic and recurrent variation which regularly differentiates the item for March from that for February or December, then we could legitimately compare the indices 95, 57, and 117. But the iron industry is seasonal in character. Just as a normal production for 1904 is not normal for 1918, so, within any year, a "normal" production for March is not normal for February or December. If we represent the average monthly production for any year by 100, the production for March, February, and December would be represented by 106, 94, and 100, respectively.* Consequently, the seasonal indices 106, 94, and 100 should be subtracted from the indices of 95, 57, and 117 found above, in order to get significant figures for comparison. The differences are — 11 — 37 and 17.

These differences are "percentage deviations of original items from secular trend corrected for seasonal variations." They are comparable with each other; and they measure the relative activity (with respect to existing equipment) of the iron industry in March, 1904, February, 1908, and December, 1918. The deviations reveal the depression in March, 1904, the deep

*See Table 2 for these indices. Table 14 and Chart K present the indices of seasonal variation for interest rates.

depression of February, 1908, and the great activity of December, 1918.

These deviations become still more significant when we compare them with others computed in the same manner for the period 1903–18. The months of deepest depression in the period were December, 1903 (–44), January, 1904 (–38), January to June, 1908 (ranging from –37 to –44), November and December, 1914 (–40 and –41). The months of greatest activity were March, 1905 to October, 1907 (ranging from 9 to a maximum of 26 in July, 1907), August, 1909 to April, 1910 (ranging from 12 to 27), and September, 1915 to December, 1918 (ranging, with five exceptions, from 10 to 24). Negative deviations of –14 and –13 occurred in January and February, 1918, as exceptional items in a series of forty positive deviations. They were undoubtedly caused by the severity of the winter, the railroad tieup, and the fuel difficulties of the months in question. December, 1917 (2) and March, 1918 (6) were also low.

Analysis of Sequence of Fluctuation

The individual items of the various series were thus corrected for secular trend and seasonal variation and the first part of our statistical problem was solved. The second part of the statistical problem was to compare the various series with each other in order to secure sequence of fluctuations.

In order to make a legitimate comparison of the fluctuations of the various series with each other, such series were expressed in terms of proper units selected with reference to the problem in hand. Some of the series were much more variable than others, that is, their upward and downward fluctuations were more frequent and more extensive than others. Railroad gross earnings fluctuated between ten per cent below and ten per cent above normal; while the number of shares traded on the New York Stock Exchange fluctuated between fifty per cent below and sixty-three per cent above. Evidently a common measure of variability was needed, in terms of which each of the series might be expressed in such a manner as to make their fluctuation on the chart strictly comparable.

The measure adopted was the "standard deviation" — the most widely used index of variability. This is an average depending upon all of the items and varying directly with the dispersion of the items; the wider the dispersion of the items the greater is the standard deviation. By using the standard deviation as the unit we are able to make a legitimate comparison between such widely different series as pig-iron production and rates on commercial paper.

Graphic Illustration of Method

A graphic illustration of the method of correcting the various series and getting them into shape for comparison is given by the accompanying charts presenting the monthly tonnage of pig iron produced in the United States and the monthly rate of interest on sixty-to-ninety-day commercial paper in New York, for the period 1903 to 1920. Charts 2 and 14 present, first, the actual data by open points; second, the long-time or secular movements of the series by the dot-dash lines; and third, the cyclical movements by the heavy curved lines. Charts 102 and 114 present the two series just named corrected for secular trend and seasonal variation. The units used are the respective standard deviations. The method and results of comparing the various corrected series will be explained in the following section.

Table 2 Monthly Tonnage of Pig Iron Produced in the United States

(Data for January 1903 to January 1917 inclusive)

FREQUENCY TABLES, ARRANGED BY MONTHS, OF RELATIVES FOUND BY EXPRESSING THE ITEM FOR EACH MONTH AS A PERCENTAGE OF THE ITEM FOR THE PRECEDING MONTH

RELATIVES	Jan. Dec.	Feb. Jan.	Mar. Feb.	Apr. Mar.	May Apr.	June May	July June	Aug. July	Sept. Aug.	Oct. Sept.	Nov. Oct.	Dec. Nov.
Below 70												/
70												
71												
72												
73											/	
74												
75												
76												
77												
78											/	
79												
80												
81												/
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93							/					/
94		/		//			//			/	/	
95	/	/		//			//	/			/	
96				/	/		/		/			/
97		//		//			//	//		/	/	
98							/		/	//	///	
99	////			//	/			/	/	//		
100	//	/		//				//	//	/	/	/
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102		/		/	/			//	//	/	//	/	///
103	/	/			/	/				///			/
104					//				/	/			
105		/				/							/
106	/				//				//	/	/		/
107			//	/	/				//		//		
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131		/											
132													
133													
134													
135													
136													
137													
138													
139													
140													
Over 140													
Medians	100	96	114	98	102½	95	100	103	101	107½	96	102

ADJUSTED MONTHLY INDICES OF SEASONAL VARIATION

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Indices	99	94	106	103	104	98	97	98	98	105	99	100

Table 14 Monthly Rate of Interest on Sixty-to-Ninety Day Commercial Paper in New York

(Data for January 1890 to January 1917 inclusive)

FREQUENCY TABLES, ARRANGED BY MONTHS, OF RELATIVES FOUND BY EXPRESSING THE ITEM FOR EACH MONTH AS A PERCENTAGE OF THE ITEM FOR THE PRECEDING MONTH

RELATIVES	Jan. / Dec.	Feb. / Jan.	Mar. / Feb.	Apr. / Mar.	May / Apr.	June / May	July / June	Aug. / July	Sept. / Aug.	Oct. / Sept.	Nov. / Oct.	Dec. / Nov.
Below 70					/						/	
70						/						
71												/
72										/		
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99			/	/	///	///	/	//		/	//	
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101			///		/	/		//	//	/	/	/
102		/		//	/	//	////	/	//	//	/	/
103		/	/	//		/	/	/		//	//	//
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131	/											
132						/						
133												
134												
135												
136												
137												
138												
139											/	
140			/									
Over 140			/					//				
Medians	90	94	105	99	98	98	108	109	108	102	98	103

ADJUSTED MONTHLY INDICES OF SEASONAL VARIATION

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Indices	99	92	96	94	92	89	95	103	110	112	108	111

CHART K

COMPARISON OF THE SEASONAL VARIATIONS OF

The average yield of ten railroad bonds
The rate on four to six months commercial paper
The rate on sixty to ninety days commercial paper
The rate on call loans on the New York Stock Exchange

As shown by the

Adjusted Monthly Indices of Seasonal Variation Average for year = 100

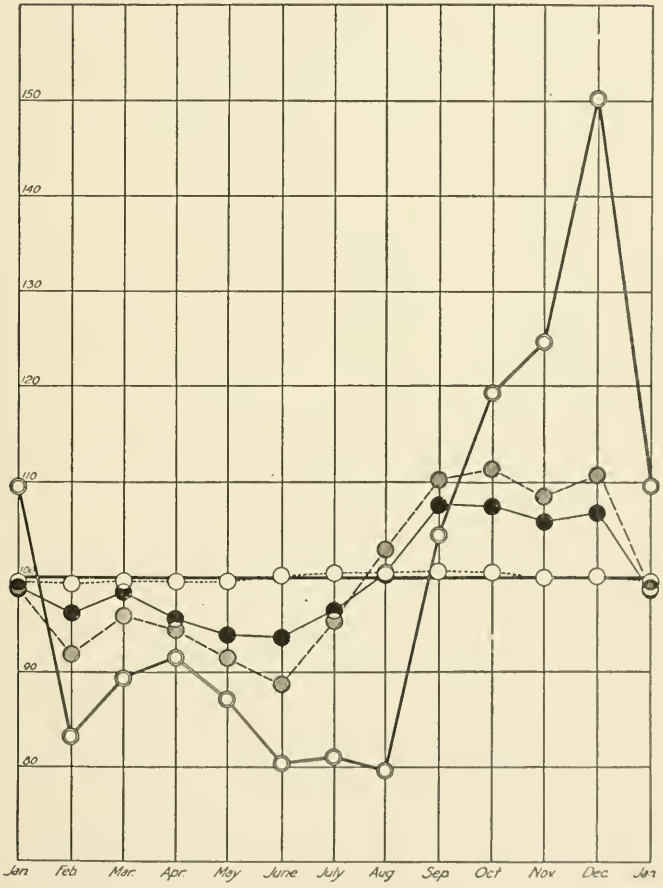


Chart 2 — *Actual Figures* for Monthly Tonnage of Pig Iron Produced in the United States, 1903–14.

(a) Production in units of 1,000 gross tons.
(b) Straight line fitted to date for 1903–16.
(c) Twelve months' moving average, centered.

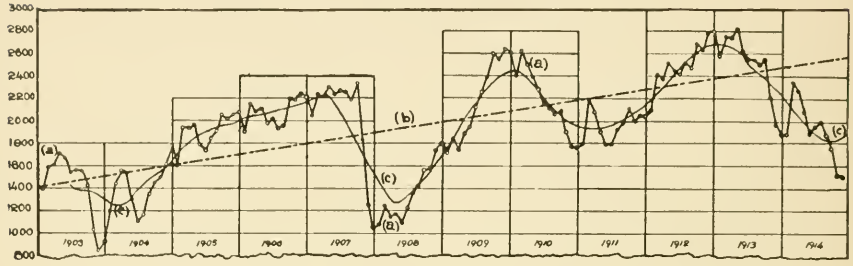
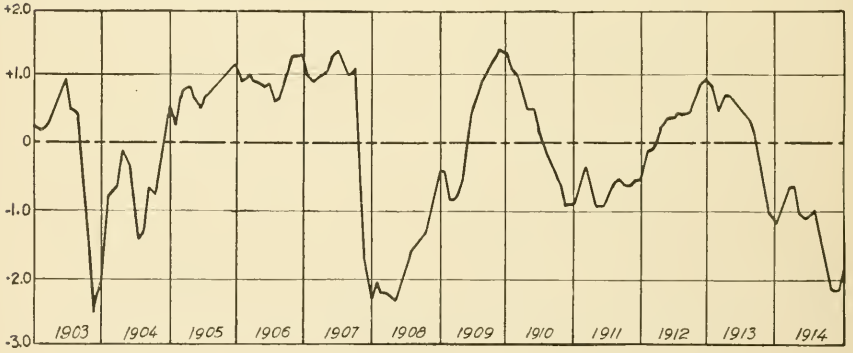


Chart 102 — *Corrected Figures* for Monthly Tonnage of Pig Iron Produced in the United States, 1903–14.



Explanation — The corrected figures of Chart 102 were obtained from the actual figures of Chart 2 as follows:

First, the seasonal element was eliminated by dividing by the "indices of seasonal variation" given in Table 2.

Second, the growth element was eliminated by taking deviations from the straight line fitted to the actual data, termed the "line of secular trend." This line was obtained by applying the mathematical "method of least squares," which gives the line of closest "fit" to the actual data.

Third, the resulting corrected figures were divided by their "standard deviation." The magnitudes thus secured (termed "cycles") are comparable with the magnitudes similarly obtained from other series of statistics.

Chart 14 — *Actual Figures* for Monthly Rate of Interest on Sixty-to-Ninety-Day Commercial Paper in New York, 1903–14.

(a) Rates in units of one per cent.
(b) Straight line fitted to data for 1903–16.
(c) Twelve months' moving average, centered.

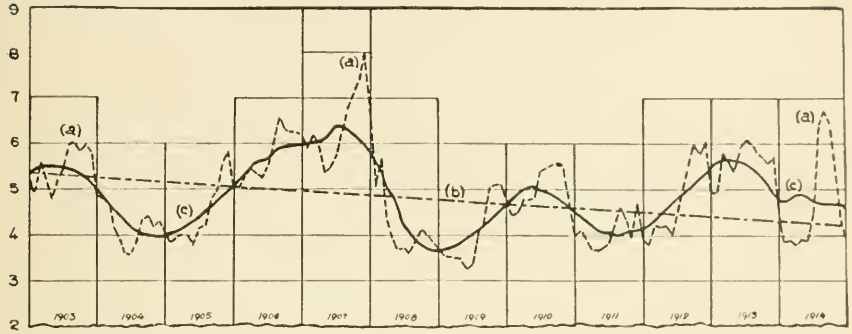
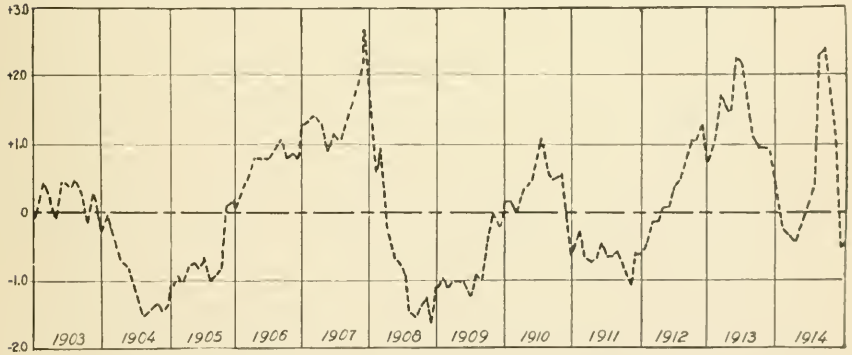


Chart 114 — *Corrected Figures* for Monthly Rate of Interest on Sixty-to-Ninety-Day Commercial Paper in New York, 1903–14.



Explanation — The corrected figures of Chart 114 were obtained from the actual figures of Chart 14 as follows:

First, the seasonal element was eliminated by dividing by the "indices of seasonal variations" given in Table 14 and Chart K.

Second, the growth element was eliminated by taking deviations from the straight line fitted to the actual data, termed the "line of secular trend." This line was obtained by applying the mathematical "method of least squares," which gives the line of closest "fit" to the actual data.

Third, the resulting corrected figures were divided by their "standard deviation." The magnitude thus secured (termed "cycles") are comparable with the magnitudes similarly obtained from other series of statistics.

CHAPTER IV

THE SEQUENCE OF FLUCTUATIONS

Three Distinct Groups

The corrected series, which we have termed cycles, are expressed in proper units for comparison. Two of the corrected series are presented graphically in charts 102 and 114. These curves were drawn originally on translucent paper so that they could be compared with each other according to the method indicated by Charts A, and 114 and 122.

Each one of twenty-two corrected series was compared graphically with every other series by placing consecutively one sheet of translucent paper with its curve over the other sheets. The comparisons were made over an illuminated box by three independent observers and the recorded results were reconciled.

Each observer recorded (a) the degree of correlation (high, moderate, low) for the best fit of the curves, (b) the amount of lag in months for maximum correlation, and (c) the consistency of lag during the period examined. The conclusions of the observers were further verified by computing "coefficients of correlation."

It was found that the various series fell into three distinct groups when arranged in order of sequence of fluctuations. The series which fluctuate first, either upward or downward, are all series depending upon investment and speculation, such as the average price of ten railroad bonds, the average price of industrial stocks, the average price of railroad stocks, the volume of sales on the New York Stock Exchange, and New York clearings. This is the speculative group.

The series in which the fluctuations follow or lag behind, in

point of time, the fluctuations of the speculative group, all have to do with business and industrial activity such as pig-iron production, bank clearings outside New York City, Bradstreet's indices of commodity prices, and the index of commodity prices of the Bureau of Labor Statistics. These series constitute the business group.

The series which fall into the third group and whose fluctuations lag behind those of the business group all have to do with banking conditions and the money market. These series are rates on commercial paper and loans and deposits and reserves of New York banks. We therefore have three homogeneous groups of series — the speculative group, the business group, and the banking group.

Composition of the Index

The arrangement of the series according to the order in which fluctuations occurred was based upon a comparison of the entire curves for the period 1903–14. It is legitimate to average the series of each of the three groups because the fluctuations of the series in the respective groups are similar.*

The three averages for 1903–14 are presented graphically on pages 30–31. It will be noticed that each average contains two classes of series — one class representing volume, the other price of (A) securities, (B) commodities, and (C) loans, as follows:

Group A — Speculation is based upon (1) the volume of speculation represented by New York bank clearings, and shares sold on the New York Stock Exchange, and (2) prices of bonds, industrial stocks, and railroad stocks.

Group B — Business is based upon (1) the volume of commodities produced and exchanged, such as pig-iron production,

*In averaging the series of the third group, however, the algebraic signs of the items entering the series for loans and deposits and reserves were reversed in combining the last named series with the interest rate series. As rates on commercial paper go up the volume of loans goes down.

outside clearings, imports of merchandise, and gross earnings of railroads, and (2) the prices of commodities.

Group C — Banking is based upon (1) the volume of credit extended as indicated by loans, deposits and reserves of New York banks, and (2) the price of such credit as indicated by the rates on commercial paper.

Index Charts

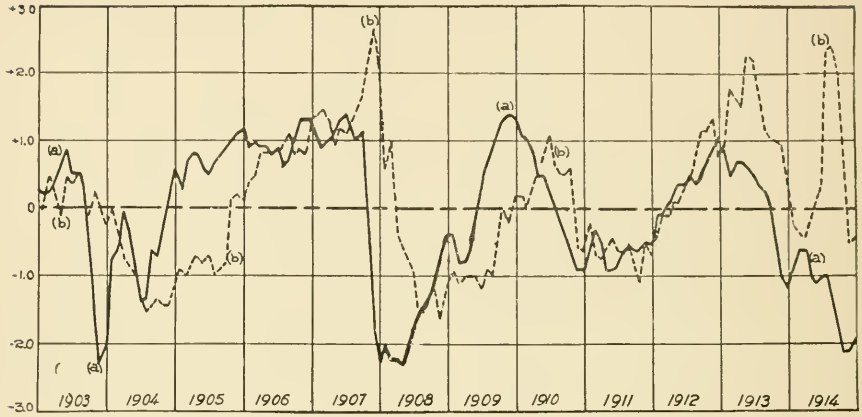
The charts presenting the averages of these three groups of series are our index charts of general business conditions, given for the period 1903–14 on pages 30–31, and for the period November, 1918 to January, 1922, on page 39.

Charts for the 1903–14 period, reproduced on a larger scale, together with a tabular statement of the "lengths and features of various phases of business cycles during 1903–14" are given in the frontispiece.

Charts 102 and 114 — *Comparison of Corrected Figures or Cycles* of

(a) Monthly Tonnage of Pig-iron Produced in the United States, and

(b) Monthly Rate of Interest on Sixty-to-Ninety-Day Commercial Paper in New York.



Explanation — Chart 102 and Chart 114 were drawn on translucent tracing paper in order to facilitate comparison of the two curves. Such comparison was made over an illuminated box, the curves being shifted to the right or left until the best "fit" was secured. The following conclusions were recorded:

(a) The "fit," or correlation of the curves is high and positive.

(b) The best fit is obtained when the curve for interest rates is shifted six months to the left. The cyclical movements of pig-iron production, therefore, forecast such movements in interest rates by six months on the average.

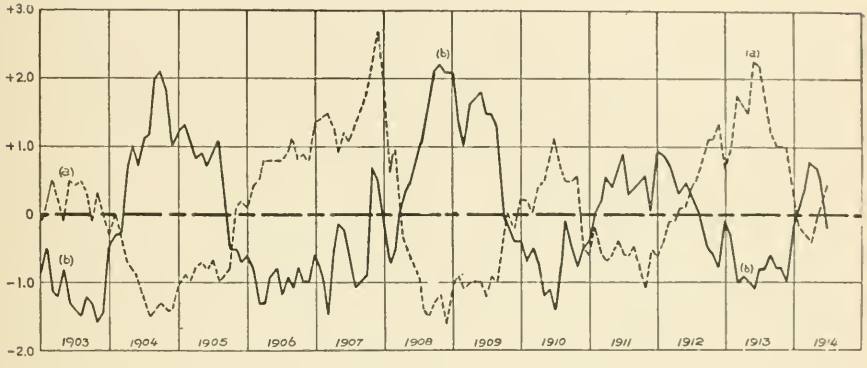
(c) The lag of six months is fairly systematic for the entire period 1903–14, although the best fit of the two curves for the period 1903–06 is obtained for a lag of one year in interest rates, for the period 1907–10 a lag of six months, and for the period 1911–14 a lag of three months.

The conclusions thus obtained were verified by computing three "coefficients of correlation" for the items of pig-iron production paired with items of interest rates four months, six months, and eight months later respectively. The coefficients resulting were +.72, +.75 and +.70 for the respective pairings, indicating that the "fit" for a six months' lag of interest rates is better than that for any other lag.

Charts 114 and 122 — *Comparison of Corrected Figures or Cycles* of

(a) Monthly Rate of Interest on Sixty-to-Ninety-Day Commerical Paper in New York, and

(b) Monthly Average Loans of the New York City Clearing House Banks.



Explanation — The cyclical movements of interest rates and bank loans are inverse. When interest rates move upward, bank loans decrease; when interest rates move downward, bank loans increase. This relationship was maintained systematically for concurrent items of the two series, *with one marked exception*, throughout the period 1903–14. From September, 1907, to February, 1908, the two curves moved together instead of inversely. The explanation of the exception to the rule is this: during the panic months of the autumn of 1907 business men and speculators were compelled by the exigencies of the situation to borrow in spite of exorbitant interest rates; during the ensuing months of depression their confidence in the future of business had evaporated and the rapidly falling rates were, for a time, not sufficient to induce borrowing.

SEQUENCE OF FLUCTUATION OF VARIOUS SERIES
SECULAR TREND) DURING THE PERIOD INCLUD

(*Arranged in Order of Dates of*

Series	Date of maximum	Date of following minimum
SPECULATION		
1. Price of 10 railroad bonds	Aug. 1905	Nov. 1907
2. Price of industrial stocks	Jan. 1906	Nov. 1907
3. Price of 20 railroad stocks	Jan.–Sept. 1906	Nov. 1907
4. Bank clearings of New York City	Jan. 1906	Dec. 1907
5. Shares sold on New York Stock Exchange	Jan. 1906–Mar. 1907	June 1907–Apr. 1908
BUSINESS		
6. Unfilled orders of the United States Steel Corporation	Dec. 1906	June 1908
7. Imports of merchandise	Dec. 1906	Mar. 1908
8. Number of business failures (*Bradstreet's*)	Jan. 1907*	Jan. 1908*
9. Value of building permits for 20 leading cities	Apr.–May 1907	Mar. 1908
10. Index of commodity prices (*Bradstreet's*)	Mar. 1907	June, 1908
11. Gross earnings of 10 leading railroads	May, 1907	July, 1908
12. Bank clearings outside New York City	Jan.–May 1907	Dec. 1907
13. Production of pig iron	July, 1907	Jan. to May 1908
14. Index of commodity prices (Bureau of Labor Statistics)	Oct. 1907	June 1908
BANKING		
15. Loans of New York Banks	Mar.–Oct. 1907*	Sept. 1908*
16. Deposits of New York Banks	Mar.–Oct. 1907*	Nov. 1908*
17. Reserves of New York Banks	Nov. 1907*	Sept. 1908*
18. Rate on 60–90-day commercial paper	Dec. 1907	Dec. 1908
19. Rate on 4–6 months' commercial paper	Nov.–Dec. 1907†	Sept.–Nov. 1908

*For this series the column headings should be minimum, maximum mini
†Four-to-six months' paper, not salable during panic.

(*CORRECTED FOR SEASONAL VARIATION AND*
ING THE PANIC OF SEPTEMBER–OCTOBER, 1907

Maxima previous to the Panic)

Date of following maximum	Remarks
Apr. 1909	The rise from Aug., 1905, to Nov., 1907, and the fall to Apr., 1909, were steady.
Aug. 1909	Prices were high during 1906, and then fell precipitately until Dec., 1907.
Aug. 1909	do. do.
June 1909–Jan. 1910	Clearings were high from Jan., 1906, to Mar., 1907, fell precipitately until Dec., 1907, and then rose steadily.
Aug. 1909–June, 1910	The volume of sales was high from Jan., 1906, to Mar., 1907.
Dec. 1909	The decline from Dec., 1906, to June, 1908, was uninterrupted.
Mar. 1910	Imports were high from Dec., 1906 to Aug., 1907. A precipitate fall began in Sept. and a steady recovery began April, 1908.
Jan. 1910*	The decline was consistent from Dec., 1905, to Jan., 1907. A marked increase did not occur until the panic broke in October.
Apr.–July 1909	The volume was high from the middle of 1905 to May, 1907.
Jan. 1910	A violent rise began in Aug., 1906. Prices continued high through Oct., 1907. The rise after June, 1908, was steady.
Mar. 1910	The rise from middle of 1906 to May, 1907, was steady and the ensuing fall was precipitate.
Mar. 1910	Clearings were very high in 1907 previous to November. The recovery following Dec., 1907, was steady.
Dec. 1909	Production was very high between June, 1906, and Oct., 1907, and then fell precipitately until Jan., 1908.
Mar. 1910	The index was very high in 1907 through October. The fall was precipitate. The rise did not begin until Dec., 1908.
July, 1910*	Contraction of loans began in Nov., 1905, and continued to Mar., 1906. An irregular fluctuation of loans took place in 1907 with expansion in May and November.
July, 1910*	The movements of deposits is almost identical with that of loans.
May, 1910*	Reserves reached a low point in Feb., 1907, but an acute drop occurred in Nov. to Dec., 1907.
July, 1910	Rates increased steadily after Jan., 1905, and violently after July, 1907. The fall during 1908 was precipitate.
July, 1910	do. do.

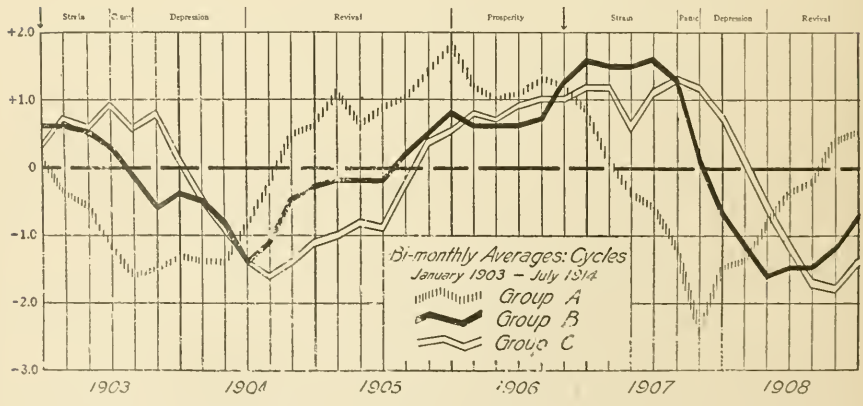
mum, respectively.

CHAPTER V

THE INDEX, 1903–1914

Time Relationship Between Series

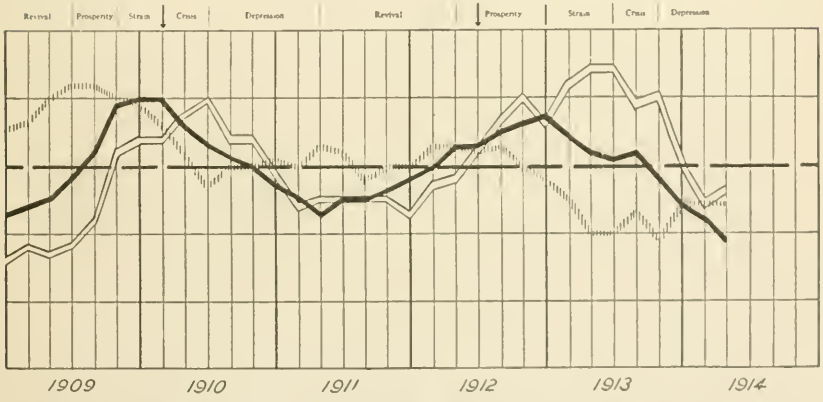
It will be seen that the shaded line, which represents speculation, forecasted very accurately all the major movements of the solid line which represents business activity during the period covered by the chart. Thus at the opening of 1903 the shaded line showed a downward movement of speculation, which had probably set in before the opening of that year; while the solid line had not yet begun to move in a downward direction. During March to April, 1903, the solid line began to follow the shaded line downward, and it continued to fall, with only a partial recovery at the end of 1903, until the middle of 1904 when it reached its lowest point on this movement. Meanwhile speculative activity, as reflected by the shaded line, had begun to recover from the depth of the depression of 1903. It reached its lowest point in the fall of 1903, and then began to move very



Group A—Speculation Group B—Business Group C—Banking

slowly upward. In July to August, 1904, the shaded line began to move upward very rapidly, reflecting the speculative activity which culminated in the year 1906. Beginning in the middle of 1904, the solid line moved sharply upward, following the shaded line. Late in 1906, the shaded line, which had already receded somewhat from the high position reached at beginning of the year, began to move rapidly downward. Business activity represented by the solid line, continued to move upward until it reached the high level which it maintained during the first six months of the year 1907, while speculative activity, as indicated by the shaded line, was rapidly falling off, presaging the approach of the panic of 1907. By November of that year the panic had occurred and speculation was at a low-water mark. Business activity and commodity prices, as indicated by the solid line, had moved very rapidly downward from the high point at which they were maintained during the first half of the year. They continued to fall until the middle of 1908; but meanwhile speculative activity had begun to revive and the shaded line representing speculation crossed the price line again early in 1908. This was exactly what had happened in the middle of 1904.

After 1908 the same general relationship between the shaded



Group A—Speculation Group B—Business Group C—Banking

and solid lines continued to be maintained, even through such years as 1910, 1911, and 1912, in which the upward and downward movements in both speculation and business were much less marked than during the years 1904 and 1908.

The double line, which represents banking conditions, shows that at the opening of 1903 interest rates were high, bank reserves had been depleted, and the volume of bank loans had necessarily been reduced. This condition of financial strain was maintained until the end of 1903 when the "rich man's panic" occurred, then the double lines started to follow the solid line downward. Banking conditions continued to get easier until the autumn of 1904, when, two months after the solid line had started to move upward, the double line followed suit. It will be seen that the banking curve was the last to decline in the crises of 1903 and 1907 and also was the last to recover. It will be observed, too, that the relationships which existed from 1903 to 1908 continued during the rest of the period covered by the chart.

Forecasting of Movements

Not only does the shaded line forecast the movement of the solid line, and the solid line forecast the movement of the double line, but also the double line forecasts the movement of the shaded one. For instance, at the opening of 1904, the double line, which represents interest rates, was rapidly falling and the shaded line which represents security prices was very slowly recovering from the depression of 1903. In July to August, 1904, the shaded line started sharply upward and crossed the double line. Clearly enough, a sharp decline in interest rates preceded by several months the sharp rise in security prices which took place in the last six months of 1904 and continued throughout the following year. The close relationship between the double and the shaded lines is also apparent in their movements during 1906. From the low point reached in September to October, 1904, the double line had rapidly risen until it reflected high interest rates and a strained financial condition in the opening months of the year 1906. This sharp rise is followed by a

moderate downward movement of the shaded line during the year 1906. During this year banking conditions became increasingly difficult, as indicated by the double line. By the latter part of that year the shaded line began to move sharply downward. In November, 1907, at the time of the panic, the double line is nearly at the highest point and the shaded line at the lowest point reached during the twelve years. Immediately thereafter the double line moves abruptly downward and the shaded line rises to meet it, crossing it just before the middle of 1908. Similar relations seem to have been maintained between the double and shaded lines to the end of the period covered by the chart.

Period of Transition 1914-18

The chart for the period 1914–18 has not been reproduced because this was a period of transition in which the normal relation previously existing between the various series was so greatly disturbed that the fluctuations have little or no bearing upon the present situation.

CHAPTER VI

THE RATIONALE OF THE FLUCTUATIONS

Phases of the Business Cycle

The established sequence of the fluctuations of the three curves and the constitution of the grouping upon which they are based enables us to explain the business cycle in economic terms. Examination of the index chart for 1903–14 shows clearly five recurrent phases in the business cycle, each phase occurring three times during the period from 1903–13. The five phases are:

Depression
Revival
Business prosperity
Financial strain
Industrial crisis

Each phase of the business cycle is distinguished by characteristic movements of speculation, of business, and of banking. The peculiar features of each phase together with the length of time each continued are set forth in the table of the frontispiece.

The Sequence of Fluctuations Described

The sequence of fluctuations and the inter-relation between speculation, business, and banking during the various phases of the business cycle are as follows:

Starting with depression, *phase 1*, we have as a legacy from the preceding period of liquidation: (a) low prices of securities and volume of speculation, (b) declining commodity prices and business activity, (c) declining rates on commercial paper and increasing bank reserves. This situation, which existed during the first half of 1904, for instance, paves the way for revival. The low volume of speculation and decreasing business activity

have their correlative in rapidly falling rates for commercial loans. Rates presently decrease to a point which makes it profitable to purchase securities. In other words, securities selling at a very low price bring higher returns, even with depressed business, than the rate at which short-time money can be obtained. Idle funds, therefore, are drawn into the speculative market to purchase bonds and high grade stocks. As the speculative advance goes on the lower grade securities are purchased. With the upward movement of speculation we enter into the second phase of the business cycle. Increasing speculation is followed by increasing business activity. Funds are available at low rates to finance business, and consequently, an increase in business activity follows the advance in speculative activity. In *phase 2*, therefore, we have increasing speculation, increasing business, and increasing rates for short-time money following each other in the order named.

Presently, however, the demand of speculation and business for funds cannot both be granted to the degree demanded and we enter *phase 3*. Business is competing against speculation and speculation must give way. Manufacturers and dealers are the year-in-and-year-out customers of the banks and if the shortness of funds makes discrimination necessary, the discrimination will be in favor of business men and against speculators. Funds are therefore withdrawn by banks from the speculative market to finance business men whose needs grow as commodity prices increase.

The situation just described leads to *phase 4* of the business cycle, the chief characteristic of which is money strain. The drain of funds from security markets into business, causes as its immediate effect, high rates for collateral loans whether on call or time. The bull market in securities characteristic of phase 2, and the hesitation characterizing phase 3, is replaced by a bear market characterizing phase 4. Business activity continues during phase 4, and absorbs the available funds so that low bank reserves result. During this period and the preceding, there are many new business undertakings, some of which are sure to prove ill-advised. Credit has been extended by some banks on

securities of doubtful value or on commodities at inflated prices. In other words, there are weak places in the business and banking structure which may give way upon the occurrence of some untoward event. With the occurrence of some such event, which causes loss of confidence, we pass into *phase 5*, characterized by more or less drastic liquidation in both security and commodity markets.

If such liquidation takes place gradually we have a type of industrial crisis which is not spectacular. The liquidation may cover so short a time and be so drastic, however, that the crisis will be accompanied by a panic. In the case of gradual liquidation it is difficult to locate the exact time of the turning point. In the case of drastic liquidation it is possible to locate the turning point within narrow limits. Following the crisis, whether it be gradual or abrupt, there are cancellation of orders, closing of factories, unemployment, rapidly decreasing rates for loans, and increasing bank reserves. This is the period of business depression with its declining money rates and low security prices with which we started.

Pivotal Factors

This account of the business cycle, based upon our statistical analysis, revolves about the fluctuation of short-time interest rates, speculation, and business.

We may think of interest rates as varying inversely with the amount of the bank reserves in the credit reservoir. The flow in the supply pipe to this reservoir depends upon the volume of gold imports, gold production, and the volume of paper currency. There are three outlets from this reservoir of credit. One pipe furnishes credit for speculation in securities; a second pipe is for the flow of credit into business; the third is for gold exports and currency for domestic uses.

When the level of credit in the reservoir is high, and perhaps the outlet to business is partially clogged, the flow of funds into speculation begins. After this flow goes on for some time, however, and the flow into business increases, the level of credit

in the reservoir falls. Obstruction is offered to the flow into speculative markets by the devices of higher interest rates and direct discrimination against speculation and in favor of business. The outlet into speculation therefore becomes clogged but the flow into business goes on. The level in the reservoir becomes still lower until the time is reached when bankers consider it dangerous to allow the outflow to continue. We then have a halt in further credit expansion, or to use our illustration, the credit outlets are clogged for a time and bank reserves are brought back to normal by allowing the supply to again fill the tank.

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CHAPTER VII

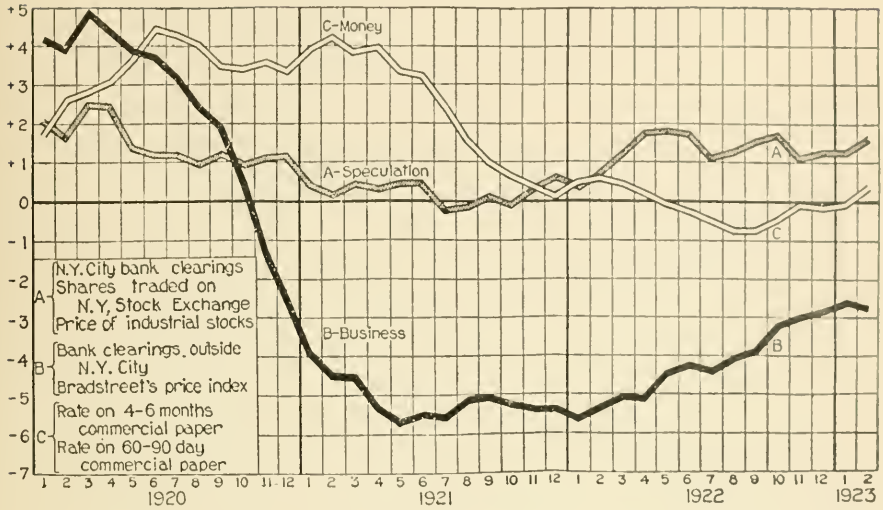
THE INDEX, 1918 TO JANUARY 1, 1923

Recent Special Difficulties

For the period 1914–18 the index of general business conditions appears to be valueless as a guide to present business developments. This was expected when it was constructed. The Great War and government control of industry dislocated economic conditions to such an extent that the normal relations which the index shows to have obtained in time of peace, could not fail to be disturbed, so that our chart (not here reproduced) shows for the period extending from 1915–18 nothing but the abnormal conditions resulting from the war. The fluctuations of the statistical series during the war were violent and apparently erratic. It is not likely that even the most careful study of the movements that prevailed during the war period will throw any light on the course of current fluctuations.

When the task of constructing an index of business conditions for the year 1919 was undertaken, three difficulties were faced: (1) many of the sources of business statistics, such as imports, value of building permits, number of business failures, and railroad gross earnings were in the early months of 1919 still subject to influences of various kinds which made them temporarily of little use for our purpose; (2) some of the series of statistics, such as commodity prices and interest rates, show that there has been an abrupt break in the continuity of the phenomena which they measure and reflect; (3) still other series such as reserves of New York banks, and perhaps loans and deposits of such banks, have permanently lost their significance as indices of business conditions because of a change in economic organization or for other reasons.

INDEX CHART, 1920–1923



Make-up of Current Index Chart

In consequence of these difficulties it was necessary, first, to discard some of the series previously used, and second, to make adjustments in the series retained to allow for the change of level that occurred during the period of transition 1914–18. The current index chart is based upon the following groups of series:

A. SPECULATION:

New York clearings
Shares traded on the New York Stock Exchange
Price of industrial stocks

B. BUSINESS

Bank clearings outside New York City
Bradstreet's indices of commodity prices

C. BANKING

Rate on four-to-six months' paper
Rate on sixty-to-ninety-day paper

Certain adjustments had to be made in these series. For instance, our economic analysis led us to the conclusion that the level of commodity prices had definitely changed and that in order to get the significance of fluctuations at the present time, such fluctuations should be measured from a new level. Consequently such an estimate was made.*

Interpretation of Current Index Chart

The current index chart, then, contains three curves representing fluctuations of speculation, business, and banking, constructed from the available series such as to make the curves as similar as possible to those of the period 1903–14. The fluctuations of these curves, therefore, are to be interpreted according to the rules drawn from the analysis of the period 1903–14, making due allowance, of course, for such changes in the economic structure or underlying conditions as appear to have taken place.

The meaning to be derived from the current index, we conclude, is to be obtained, first, by statistical analysis, that is by observing the correspondence of current fluctuations to those of the period 1903–14, and second, by economic analysis, that is, by comparing the fundamental conditions underlying the present situation with those underlying apparently similar situations in the period 1903–14.

Forecast in February, 1920

The forecast in February, 1920, was as follows:

"The continued decline of speculation in securities, of security prices, and of central bank reserves, together with the increase of rates on commercial paper, indicate that we are now in that

*The adjustment of the various series made necessary by the period of transition 1914 to 1918 are explained in detail in the supplements to *The Review of Economic Statistics* for June and July, 1919.

phase of the business cycle characterized by financial strain, liquidation of securities, and a check to the upward movement of commodity prices and business activity.

"Our Index of General Business Conditions and supplementary economic analysis lead us to the conclusion that the liquidation which began in security markets last November will be followed by a recession of commodity prices and a decrease of business activity. Continued depression in security markets accompanied by liquidation in commodity markets, which will continue until the financial strain is relieved, is our forecast of the probable developments of the next four or six months.

"It does not now appear probable that the liquidation in commodity markets will lead to panic. Price recessions in iron, steel, and other commodities, would undoubtedly uncover a considerable domestic demand from public utilities. Other industries, such as those handling building materials and petroleum, also appear to be in a relatively strong position and such price recessions in their products as occur may be small. A marked decrease in our excess of exports is one of the probabilities, however, and certain industries, such as those dealing in luxuries, those selling to the European market, and those competing in the home market against foreign producers, may be severely affected.

"Two disturbing developments which have been in progress since the opening of the year may lead to serious difficulties. One is the sensational rise of commodity prices amounting to 4 per cent in the single month of January. The other is the persistent decline of reserves of the combined federal reserve banks in a season when reserves normally increase, a decline which is due in some measure to continued gold export from the United States. These developments make a readjustment in business appear more probable than it seemed a month ago; and, if they continue, will decrease greatly the severity of such adjustment."

Deductions from the Chart in 1921 and Again in Early 1923

The approximate point of stabilization in prices was reached in May, 1921.

The upward movement of Curve A "Speculation" and the decline of Curve C "Money Rates," as shown in the Chart at the beginning of this chapter, which began in the middle of the summer of 1921, forecast that substantial improvement in business conditions which was well under way, it will be noted, in early 1922. This improvement in business conditions continued without interruption into 1923.

In January, 1923, the Chart continued to forecast firm to rising wholesale prices, and expanding business activity throughout the year.

Curve C showed banking conditions still fundamentally sound, re-discounting was on a reasonable scale and there was every reason to believe that banks could readily command funds sufficient to finance business expansion for the remainder of the year. Interest rates depending so much on the policy of re-discounting could only be forecast as firm, or tending toward a higher level.

Early 1923, found considerable hesitation on the part of business men to make commitments at higher level of prices, due to fear of a "Buyers Strike" and a remembrance of the lessons of 1919 and 1920. Such a development could only be construed as favorable at that phase of the business cycle.

The Chart indicated that so long as a conservative attitude dominated the general community, the prospect of continued healthy advance remained.

TEST QUESTIONS

"MEASURING AND FORECASTING GENERAL BUSINESS CONDITIONS"

The Test Questions can be answered directly from the Text discussion. You will find them helpful for purposes of review.

1. Why has the question, when to buy or sell, such importance?

2. What value and limitations, have current predictions made upon the basis of what occurred after the Civil War or the Napoleonic Wars?

3. What is meant by seasonal variation? by secular trend? Why should these be eliminated in attempts to estimate, or measure, the influence of the cycle?

4. Which group of items tend to fluctuate first? Why should items of similar time movements be kept distinct from those of earlier or later, time movements?

5. Can dependence be placed upon a so-called "law of Action and Reaction?" Show how the mere averaging of various groups of statistics tends to produce a blurred picture.

6. When speculators and business men compete for loanable funds, which do the banks favor as a rule?

7. What three groups compose the Index described in the Text? What items in each group?

8. What are the chief characteristics of each phase of the business cycle?

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